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it is a little curious to see, that, while the great ship is certainly going to the bottom, the small torpedo-boat itself floats apparently uninjured.

#### LOCALIZATION OF FUNCTION IN THE CORTEX OF THE BRAIN.

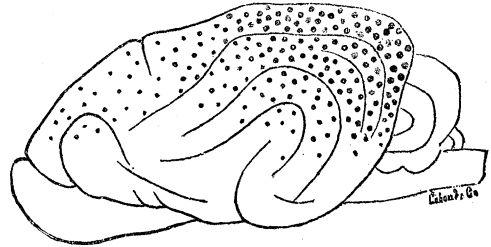
A CONVENIENT summary of the main points that have been established by experiments on animals, by pathological records and anatomical research, regarding the relation of certain parts of the brain to the various senses and systems of muscles, is a very welcome contribution to this vexed question. If, in addition, the work brings new light on some of the problems, and a worthy appreciation of its predecessors, it is doubly welcome. The recent work of Dr. Luciani and Dr. Seppilli has these claims to our highest praise.

The view of Flourens, that all the parts of the brain were functionally equivalent, was followed, after the discovery of the excitability of the cortex in 1870, by the very opposite view that the brain consisted of a collection of areas definitely circumscribed, each of which had exclusive charge of a certain function. The view held by our authors, agreeing with that of Exner, Goltz, and others, is a mean between the two. The different parts of the cortex have very different relations to the several functions. But a centre is not a definitely limited area: it has a focus and a 'periphery,' but no hard and fast boundary-lines. The peripheries of the various centres overlap. Take the usual centre, for example. If you regard the sight-centre as all that part of the cortex the removal of which will cause disturbances of vision, then this centre is almost too extended to be localized at all; but, if you distinguish between transitory and permanent (though gradually decreasing) impairment of vision, the occipital lobe, with a small part of the adjoining parietal, is at once marked as the focus of the sight-centre: its 'periphery' extends in the direction of the frontal and temporal lobes. An injury to the peripheral portions will cause less severe and less permanent impairment of vision than injury to the focus.

The extensive destruction of one occipital lobe produces blindness in a small external segment of the retina on the same side, and in a large internal segment of the retina on the opposite side; i.e., each centre is connected with both sides of the body, but more with the opposite side. This furnishes a simple scheme of the decussation of fibres in the optic chiasma. The general results

*Die functions-localisation auf der grosshirnrinde an thierexperimenten und klinischen fällen nachgewiesen.* Von Dr. LUIGI LUCIANI und Dr. GIUSEPPE SEPPILLI. Autorisirte deutsche ausgabe von Dr. M. O. FRAENKEL. Leipzig, Denicke, 1886. 8°.

are compactly represented in a diagram of the dog's brain, in which the size and proximity of the dots show the 'intensity' of the different parts of the centre, while the shaded dots show the proportion of the centre connected with the same side of the body.



The accompanying diagram of the dog's brain shows the location and extent of the *visual centres*, as proved by the impairment of vision due to extirpation of this area. The occipital region, as indicated by the size and frequency of the dots, is most immediately connected with this function; but an area of minor intensity extends towards the frontal and parietal lobes. The shaded dots indicate (roughly) the part (a smaller one) of the centre connected with the retina of the same side; the others, the part (a larger one) connected with the opposite retina.

The centre for hearing has likewise a focus and a periphery, and the scheme of decussation would be quite the same. The focus is in the temporal lobe, with the periphery extending in the direction of the parietal and frontal lobes, of the hippocampus and cornu ammonis. The attempts at localizing the centres for smell and taste are less definite and less certain.

On the pathological side, the correlation of certain disorders with lesions of certain parts of the brain tends to the same results in the main, and thus makes the experimental evidence doubly important.

The central convolutions and the immediately adjoining parts of the parietal and frontal convolutions form the sensor-motor zone. It is the terminal station for the reception of skin and muscle impressions, as well as the origin of the voluntary control over certain muscles. The motor zone is directly excitable by electrical stimulation, and is the part the irritation of which produces epileptic spasms. A study of the order in which these spasms affect different groups of muscles, with a post-mortem examination of the brain, tends to a more definite localization of the facial centre, the arm-centre, and the leg-centre. The chapter on epilepsy, from the point of view of Hughlings-Jackson, is a valuable presentation of the subject.

These cortical centres are not the places where the crude sensations are received, but the places where they are elaborated, interpreted, and associated with other impressions. They are perceptive centres.

The work of Luciani and Seppilli is an onward step in this difficult subject, and can be recommended as the best book to use for those who have only time for one book. While it leaves many problems unsolved, it gives hopes of a solution, and leaves the conviction that we are on the path towards a scientific and rational conception of the functions of the highest product of evolution, — the human cortex. JOSEPH JASTROW.

#### THE SEPARATE SYSTEM OF SEWERAGE.

THE respective merits of the separate and the combined systems of sewerage are still topics of animated discussion among sanitary engineers. Experts are not at one upon the question whether there should be one set of sewers through which should be removed the discharges from human beings and the water which in the form of rain falls upon the surface of the ground, or whether two separate and distinct sets should be constructed, each of which should be restricted to the removal of one of these varieties of waste material. The writers of this little book of 183 pages are advocates of the separate system, and believe that its moderate cost makes it possible to carry out a system of sewerage in many cases where the expense of the combined system would make the construction impossible. Most of the literature upon this subject is to be found in pamphlets, and papers presented to scientific societies, which are not available for general reference; and the authors have endeavored to supply a deficiency which their own experience has shown to exist by preparing the work now before us. Their aim has been to explain what the separate system is, what it is designed to do, and to give practical directions for designing and constructing sewers in accordance with that system. They recognize the fact that no single design is applicable to every case, but that each town will present some features peculiar to itself, and that the general plan must be modified to suit the conditions of each case. The dangers connected with, and indeed inseparable from, the old-style yard vaults and cesspools, in which filth accumulates oftentimes for years, are graphically portrayed; and the ordinary methods by which wells and streams become polluted are plainly and concisely explained. These are made a text for a

*The separate system of sewerage: its theory and construction.* By CADY STALEY and GEORGE S. PIERSON. New York, Van Nostrand, 1886.

homily upon the need of sewerage in all densely populated neighborhoods. The evils of the combined and the advantages of the separate system are contrasted; and the authors then pass on to the consideration of the designing of plans for the construction of a sewerage system, commencing with the preliminary survey, and carrying them up to the condition of completion, with the house-connections made, and the sewage on its way to the sea or other point of discharge. The volume is, considering its small size, a very comprehensive one, and will undoubtedly be of great service to those engaged in practical work of this kind.

#### CHALLENGER REPORTS.

THIS bulky volume contains the second report of Professor Herdman on the Tunicata, comprising four hundred and thirty-two pages and fifty plates, and Théel's second part of the report on the Holothuriodea, with two hundred and ninety pages and sixteen plates. The high standard of mechanical execution which has characterized previous volumes is fully maintained in both text and plates.

Professor Herdman's first report treated of the simple ascidians. The present one is devoted to the compound forms; and a final part, to discuss the pelagic groups, will probably appear next year. It was at first supposed that the forms remaining after the simple ascidians had been described could be disposed of with comparative brevity; but the compound ascidians proved, on careful examination, to be a much larger and more varied group than had been anticipated. On account of the difficulty in finding good diagnostic characters, and of the similarity which different species sometimes show in their external appearance, it has been necessary to submit nearly all the species in the collection to a detailed histological examination, and portions of most of them have had to be sectionized — a slow and laborious proceeding — before the relations of their different parts could be satisfactorily determined. Then, in the case of a few species, some interesting peculiarities in regard to reproduction by gemmation required a careful and lengthened examination, on account of the important bearing of these features upon the mode of formation of the colony.

The collection of compound ascidians represents one hundred and two species and varieties, arranged in twenty-five genera. Eighty-eight of the species and ten of the genera are here de-

*Report of the scientific results of the voyage of the Challenger during 1873-76.* Vol. xiv.: Zoölogy. London, Government, 1886. 1<sup>o</sup>.